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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] the circuit board, for example, a dot-matrix luminescence display, for this invention to carry electrical parts (henceforth an electrical part), such as diode, a lamp, and a resistance element, on the matrix circuit board -- it is related with the matrix circuit board and the plotting board which are used when manufacturing the diode driver of the body and its function.

[0002]

[Description of the Prior Art] In this kind of matrix circuit board, as shown in drawing 4, the electrode pattern which consists of an anode, the cathode side wiring (henceforth wiring) 12 and a cathode, or anode side wiring (henceforth wiring) 11 is formed in the table of an insulating substrate 13, and hidden both sides. It connects with the surface current carrying part 10 which separated in the surface electrode 9 of the electrode which considered wiring 12 formed in the rear-face side of an insulating substrate 13 as wiring 11 by the front-face side of an insulating substrate 13 through the through hole 8, and was formed. Thus, the circuit is formed by connecting an electrical part to the surface electrode 9 and the surface current carrying part 10 which were formed.

[0003]

[Problem(s) to be Solved by the Invention] However, by the configuration approach of this kind of matrix circuit, since wiring used as the current carrying part on a flat surface crossed, the through hole needed to be used or jumpering chip or solid wiring by the printed conductor needed to be performed, there was a problem in the dependability of that a process becomes complicated or connection etc. moreover -- since it is usually 18 micrometers or 35 micrometers as thickness of the conductor used as a circuit -- a conductor -- if resistance is strong and the circuit as a conductor becomes long, inclination will arise in supply voltage by the voltage drop, and problems, like in the result (it is called Following LED), for example, light emitting diode, a difference appears in brightness become easy to arise.

[0004] since a glass fiber content epoxy resin substrate with mainly bad thermal conductivity is furthermore used as an insulating material as the circuit board for through holes -- a conductor -- there was a trouble which the incorrect actuation on a circuit etc. generates that it is easy to accumulate generation of heat from a circuit or the carried electrical part.

[0005]

[Means for Solving the Problem] As a result of examining many things as an approach for solving these problems, this invention by carrying out solid wiring to the shape of a mesh various in the condition that the metallic conductor line was insulated beforehand By being able to make a circuit form on one [ at least ] flat surface, and moreover sticking a metal plate as a support plate By emitting the heat generated from an electrical part or a metallic conductor line circuit to whether you are Sumiya, removing further the insulating part of the metallic conductor line which extended the 2-way beforehand at least more than the pitch of mesh-like solid wiring, and using it as a pin for connection It came to complete header this invention for the advantage of closing connection with a drive circuit, without using a through hole if .

[0006] Namely, this invention The insulating part of the request at the time of seeing at the flat surface of the pre-insulation metallic conductor line by which solid wiring was carried out is removed to the shape of a mutual mesh at least. It is the plotting board which comes to carry LED in the functional part or the matrix circuit board which has the matrix circuit which comes to carry an electrical part in the matrix circuit board to which it makes it come to expose a metallic conductor line, and this matrix circuit board. It is characterized by the thing of mesh-like solid wiring which the metallic conductor line of a 2-way was extended at least more than the mesh pitch, and the insulating part of a metallic conductor line was removed, and was considered as the pin for connection.

[0007]

[Function and Example(s)] A drawing explains this invention to a detail below. (1) of drawing 1 is the perspective view of the plain-weave mesh-like solid wiring 14 which wove by turns the pre-insulation metallic conductor line 1 covered with the insulating material of this invention as warp and the weft. (2) Wiring 11 and wiring 12 which consist of a pre-insulation metallic conductor line 1 exposed when the plain-weave mesh-like solid wiring 14 which sank in by the insulating agent 3 is seen at a flat surface, It is a top view showing the cathode from which this wiring 11 and wiring 12 were extended, and the insulating part was removed or the pin 17 for anode side connection (henceforth the pin for connection) and an anode, or the pin 18 for cathode side connection (henceforth the pin for connection).

[0008] It is the perspective view of the twill mesh-like solid wiring 15 which changed weave and wove the line 1 as warp

and the weft, next, the pre-insulation by which (1) of drawing 2 was covered with the insulating material of this invention - - a conductor -- (2) It is a top view showing the pin 17 for connection and the pin 18 for connection from which the wiring 11 which consists of a pre-insulation metallic conductor line 1 exposed when the twill mesh-like solid wiring 15 which sank in by the insulating agent 3 is seen at a flat surface, wiring 12, this wiring 11, and wiring 12 were extended, and the insulating part was removed.

[0009] Moreover, (1) of drawing 3 makes it paste up with a support plate 2, and it uses the clearance between the plain-weave mesh-like solid wiring 14 as the circuit board at the same time it sinks in by the insulating agent 3. When it sees to the shape of a mesh at the flat surface of the pre-insulation metallic conductor line 1 by which solid wiring was carried out, it is the sectional view of the plotting board which removed the insulating part in which the electrical part of the wiring 11 exposed to a front face and wiring 12 etc. is carried, was made to expose a metallic conductor line, and pasted up the monochrome LED chip 4 on wiring 11 and wiring 12 through solder.

[0010] And (2) removes the insulating part used as loading and the bonding pad of the electrical part of the wiring 11 exposed similarly and wiring 12 etc., it exposes a metallic conductor line, pastes up the LED bare chip 6 on wiring 11 through solder, and expresses the bonding pad 5 prepared in wiring 12; and the sectional view connected with the wire 7.

[0011] Although there is no limit in any way as the quality of the material if it is an object with small electric resistance as a metallic conductor line used for the pre-insulation metallic conductor line 1 of this Invention, copper wire is suitable from the point of electric resistance and a price. And although the one thicker [ although there is especially no limit as a wire size of a metallic conductor line ] in order to make electric resistance small is good, since weaving if not much thick becomes difficult and the whole circuit also becomes large, as a size, the range of 0.01mm - 5mm is good for a diameter. The straight angle line 5mm or less by which pre-insulation was furthermore carried out may be used.

[0012] Moreover, resin, such as polyurethane, polyethylene, polypropylene, a formal, and ethylene tetrafluoride, is [ that what is necessary is just the quality of the material which has the flexibility which can be woven in the shape of a mesh by turns at least as a pre-insulation ingredient ] usable.

[0013] The weave of mesh-like solid wiring of this Invention can change weave by the helicopter loading site of the electrical part on a plain weave, twill, and other circuits, and can also form mesh-like solid wiring. And in case they may differ even if the metallic conductor line used as warp and the weft has the same wire size, and they are woven further, even if it is a metallic conductor line about one side and is in any of whether another side is made into a pre-insulation metallic conductor line, or to make both into a pre-insulation metallic conductor line, it does not interfere.

[0014] Since the plain-weave mesh-like solid wiring 14 used for this Invention and mesh-like solid wiring of twill mesh-like solid wiring 15 grade are supple, next, as reinforcement moreover, an electrical part and a conductor -- when generation of heat from a circuit becomes a problem, the resin which filled up the clearance between mesh-like solid wiring with the thermally conductive good filler as an insulating agent 3 is slushed, and it solidifies -- making -- existing filler restoration resin -- an electrical-part metallurgy group -- a conductor -- heat dissipation from a line circuit can be performed efficiently.

[0015] As resin used as an insulating agent 3, if engineer plastics thermoplastics, such as liquefied thermosetting resin, such as epoxy and a phenol, imide resin, and silicone resin, is used and it is a thermally conductive good object as a filler, there is especially no limit and impalpable powder, such as an aluminum oxide (alumina), aluminum nitride, boron nitride, silicon nitride, oxidization silicon, and cordierite, is used.

[0016] An electrical part can be attached in the part of the metallic conductor line which this Invention exposed at the easy process of applying for example, a pewter paste, laying an electrical part, and performing a pewter reflow. In order to raise pewter adhesion at this time, nickel plating, gold plate, etc. may be processed for the corrosion prevention of a metallic conductor line. As a bonding pad 5 prepared in wiring 12 further, for example, gold plate, coppering, and nickel plating are used.

[0017] Moreover, although a support plate 2 is used through the insulating agent 3, in case aluminum, silicon steel, carbon steel, SUS, Invar, etc. are used in case heat-conduction effectiveness is gathered, and this Invention seldom needs thermal conductivity, it does not interfere with resin plates, such as phenol resin, imide resin, and an epoxy resin,, either.

[0018] When the matrix circuit board of this Invention is seen at the flat surface of a plain weave or mesh-like solid wiring which carried out twill, expose it. Can produce by carrying out grinding of the insulating material of the metallic conductor line by which the location of a request of one side or both sides is not insulated, and a pre-insulation metallic conductor line with polish or a milling machine, and exposing a metallic conductor line, and Moreover, a metallic conductor line can produce both by carrying out grinding of the insulating material of a desired location with polish or a milling machine, and exposing a metallic conductor line, when covered with the insulating material.

[0019] And this circuit board can be reinforced by infiltrating a resin-like object into the clearance between mesh-like solid wiring as occasion demands, and can produce the circuit board which can be used for applications various by sticking a support plate in this case.

[0020] Next, when this Invention carries out mesh-like solid wiring, it can form at least the metallic conductor line which removed the insulating layer in a 2-way, and can use it as the pin 17 for connection, and the pin 18 for connection, and this pin 17 for connection and the pin 18 for connection can be used as an object for connection of the mother board for making it drive, when an electrical part is carried in the matrix circuit board, or a matrix circuit board comrade.

[0021] Thus, this Invention can manufacture the matrix circuit board easily by using various mesh-like solid wiring. The heat dissipation nature from a line circuit is also good. and the thing which the supply voltage to a metallic conductor line or an electrical part becomes stable, and is sunk [ clearance / between mesh-like solid wiring ] in in an insulating agent

with good thermal conductivity -- an electrical-part metallurgy group -- a conductor -- Furthermore by using it as a pin for connection, the metallic conductor line of mutual mesh-like solid wiring which extended the 2-way at least more than the mesh pitch Production of the very reliable matrix circuit board that connection of a matrix circuit board comrade can be performed keeping constant the mother board and LED dot space for making LED drive can carry out easily. What is necessary is just to attach housing etc. if needed, when using this matrix circuit board as a LED display furthermore.

[0022] Since the part made into the purpose of the carried functional part as operation using these descriptions of the matrix circuit board of this invention can be made to drive statically or dynamically, if LED and a lamp are carried, for example, it can be used as a display board, and if a resistance element is carried, it can be used as a board circuit for printing to a thermal paper.

[0023] Furthermore, an example explains this invention concretely.

Cover copper wire with a diameter of 0.5mm with example 1 polyurethane resin, and the pre-insulation metallic conductor line 1 is made. Weave a line 1 in the shape of a mesh at intervals of 2mm, and it considers as the plain-weave mesh-like solid wiring 14. this conductor -- The pre-insulation metallic conductor line 1 of two side of \*\*\*\*\* of this mesh-like solid wiring 14 was extended by 10mm as the pin 17 for connection, and a pin 18 for connection In the condition of not crossing, and where the pin 17 for connection and the pin 18 for connection are protruded from the aluminum plate of 1.5mm thickness which is a support plate 2, it put. next, the liquefied epoxy resin (oil-ized Shell: -- a trade name --) filled up with the alumina impalpable powder of 50 capacity % as an insulating agent 3 Epicoat 807 was slushed and stiffened to extent which the solid wiring intersection section front face of the pre-insulation metallic conductor line 1 exposes, the substrate was produced, and the matrix circuit board which grinds until copper wire exposes the pre-insulation metallic conductor line 1 exposed to a front face by the abrasive material, and is shown in (2) of drawing 1 was produced. The LED display board which solders the monochrome LED chip 4 (Stanley BR1101 W) for surface mounts to the required part of the copper wire which this matrix circuit board furthermore exposed, and is shown in (1) of drawing 3 was produced, the extension of a metallic conductor line was beforehand immersed in the solder bus (360 - degreeC, 2 minutes), and pre-insulation was removed, and it was used as the pin 17 for connection, and a pin 18 for connection, and connected with the drive circuit.

[0024] Except having used without covering one copper wire of the example 2 plain-weave mesh-like solid wiring 14, the same actuation as an example 1 was performed, and the LED plotting board was produced.

[0025] Cover copper wire with a diameter of 0.3mm with example 3 polyurethane resin, and the pre-insulation metallic conductor line 1 is made. Weave a line 1 in the shape of a mesh at intervals of 0.5mm, and it considers as the plain-weave mesh-like solid wiring 14. this conductor -- The pre-insulation metallic conductor line 1 of two side of \*\*\*\*\* of this mesh-like solid wiring 14 is extended by 10mm as the pin 17 for connection, and a pin 18 for connection in the condition of not crossing. Putting this on the aluminum plate of 1.5mm thickness which is a support plate 2, after the parts of the pin 17 for connection and the pin 18 for connection had overflowed, the following produced the circuit board by the same actuation as an example 1. Next, nickel plating is performed to the copper wire ground and exposed until copper wire exposed with abrasives the pre-insulation metallic conductor line 1 exposed to the front face of this matrix circuit board. Furthermore, gold-plate on it and the LED bare chip 6 of 300-micrometer angle is soldered to this plating part at wiring 11. Moreover, the LED plotting board which makes wire-bonding connection by the 50-micrometer gold streak by making into a wire 7 the bonding pad 5 prepared in wiring 12 and which is shown in (2) of drawing 3 was produced.

[0026] example 4 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- the line 1 was woven in the shape of a mesh at intervals of 2mm, it considered as the twill mesh-like solid wiring 15, and the matrix circuit board shown in (2) of drawing 2 like an example 1 below was produced. The 2 color LED chip 16 (Stanley BRPY1201 W) for surface mounts was soldered to the required part of the copper wire which this matrix circuit board furthermore exposed, and the LED plotting board was produced.

[0027] Using the liquefied epoxy resin which is not filled up with a filler as an example 5 Insulation agent 3, except having used the phenol plate with a thickness of 2.0mm as a support plate 2, the same actuation as an example 1 and an example 2 was carried out, and the LED plotting board was produced, respectively.

[0028] example 6 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- the line 1 was woven in the shape of a mesh at intervals of 2mm, it considered as the plain-weave mesh-like solid wiring 14, and the pre-insulation metallic conductor line 1 of two side of \*\*\*\*\* of this mesh-like solid wiring 14 was made to extend by 10mm as the pin 17 for connection, and a pin 18 for connection in the condition of not crossing Next, the pin 17 for connection and the pin 18 for connection of the plain-weave mesh-like solid wiring 14 are stood upward. It is made for the liquefied epoxy resin (oil-ized Shell: a trade name, Epicoat 807) filled up with the alumina impalpable powder of 50 capacity % as an insulating agent 3 not to be attached to the parts of the pin 17 for connection, and the pin 18 for connection. It was made to slush and harden to extent which a solid wiring intersection section front face exposes, the substrate was produced, and the matrix circuit board which grinds until copper wire exposes the pre-insulation metallic conductor line 1 exposed to a front face by the abrasive material, and is shown in (2) of drawing 1 was produced. The LED display board which solders the monochrome LED chip 4 (Stanley BR1101 W) for surface mounts to the required part of the copper wire which furthermore exposed this matrix circuit board, and is show in (1) of drawing 3 was produced, the extension of a metallic conductor line was beforehand immersed in the solder bus (360 - degreeC, 2 minutes), and pre-insulation was removed, and it was used as the pin 17 for connection, and a pin 18 for connection, and connected with the drive circuit.

[0029] The matrix circuit board shown in (2) of drawing 1 like example 7 example 1 was produced, the functional part

which carries diode and a resistance element in this and has a matrix circuit was produced, the extension of a metallic conductor line was beforehand immersed in the solder bus (360-degreeC, 2 minutes), and pre-insulation was removed, and it was used as the pin 17 for connection, and a pin 18 for connection, and connected with the drive circuit.

[0030] example 8 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- the line 1 was woven in the shape of a mesh at intervals of 2mm, it considered as the twill mesh-like solid wiring 15, and the matrix circuit board shown in (2) of drawing 2 like an example 1 below was produced. The functional part which carries diode and a resistance element in the required part of the copper wire which this circuit board furthermore exposed, and has a matrix circuit was produced, the extension of a metallic conductor line was beforehand immersed in the solder bus (360-degreeC, 2 minutes), and pre-insulation was removed, and it was used as the pin 17 for connection, and a pin 18 for connection, and connected with the drive circuit.

[0031]

[Effect of the Invention] According to this invention, as above the matrix circuit board Can make having no through hole etc. and easily and, moreover, heat dissipation nature of this circuit board improves by sinking in a filler. Moreover, since electric resistance is small made rather than the copper foil circuit usually used by enlarging the diameter of the copper wire which is a metallic conductor line For example, as a matrix circuit for an LED display, the variation in brightness is small, it is cheap and it is [ moreover the good display board of heat dissipation nature can be obtained and ] also possible to use it as a board circuit for printing. Furthermore, the matrix circuit board of this invention removes the pre-insulation of the part which extended the metallic conductor line of solid wiring in the condition of not crossing, and since it is used as a pin for connection and made, it has the advantage that connection can be easily done with the circuit boards, such as other circuits for a drive, without using special coupling parts.

[Detailed Description of the Drawings]

[Drawing 1] (1) of drawing 1 is the perspective view of plain-weave mesh-like solid wiring which wave the pre-insulation metallic conductor line by turns, and (2) is a top view showing the pin for connection which consists of wiring which consists of each of the pre-insulation metallic conductor line exposed when plain-weave mesh-like solid wiring is seen at a flat surface, and an extended metallic conductor line.

[Drawing 2] (1) of drawing 2 Is the perspective view of twill mesh-like solid wiring which changed and wave the weave of a pre-insulation metallic conductor line, and (2) is a top view showing the pin for connection which consists of wiring which consists of each of the pre-insulation metallic conductor line exposed when twill mesh-like solid wiring is seen at a flat surface, and an extended metallic conductor line.

[Drawing 3] (1) of drawing 3 is a sectional view when carrying the monochrome LED chip for surface mounts in the front face of the matrix circuit board with a support plate, and (2) is a sectional view when carrying an LED bare chip in the same circuit board.

[Drawing 4] Drawing 4 is a sectional view showing the conventional plotting board.

[Description of Notations]

1 Pre-insulation Metallic Conductor Line 2 Support Plate 3 insulation agent 4 The monochrome light emitting diode chip 5 bonding pad 6 Light emitting diode bare chip 7 Wire 8 Through hole 9 Surface electrode 10 Surface current carrying part 11 A cathode or anode side wiring 12 The anode side or cathode side wiring 13 insulating substrate 14 Plain-weave mesh-like solid wiring 15 Twill mesh-like solid wiring 16 2 color light emitting diode chip 17 A cathode or pin 18 for anode side connection An anode or pin for cathode side connection

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[Translation done.]

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**CLAIMS**

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**[Claim(s)]**

- [Claim 1] The matrix circuit board which is the matrix circuit board to which remove at least the insulating part of the request of a pre-insulation metallic conductor line by which solid wiring was carried out to the shape of a mutual mesh, and it makes it come to expose a metallic conductor line, and is characterized by coming to expose the metallic conductor line of a side face which removed the insulating part as a pin for connection to the 2-way at least.
- [Claim 2] The matrix circuit board which comes to sink into the clearance between mesh-like solid wiring of the matrix circuit board according to claim 1 in an insulating agent.
- [Claim 3] The matrix circuit board which comes to stick the matrix circuit board according to claim 1 or 2 on a support plate through an insulating agent.
- [Claim 4] The matrix circuit board which comes to carry electrical parts, such as diode, a lamp, or a resistance element, in the matrix circuit board of claim 1, claim 2, or claim 3.
- [Claim 5] The plotting board which comes to carry light emitting diode in the matrix circuit board of claim 1, claim 2, or claim 3.
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[Translation done.]

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TITLE: Matrix circuit substrate for mounting electric part -  
removes given insulation portion of insulation-  
sheathed

metal conductor wire to expose metal conductor wire

NoAbstract

PATENT-ASSIGNEE: DENKI KAGAKU KOGYO KK[ELED]

PRIORITY-DATA: 1991JP-0322572 (November 11, 1991)

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ABSTRACTED-PUB-NO: JP 05134615A

**EQUIVALENT-ABSTRACTS:**

**CHOSEN-DRAWING: Dwg.3/4**

**TITLE-TERMS: MATRIX CIRCUIT SUBSTRATE MOUNT ELECTRIC PART**

**REMOVE INSULATE**

**PORTION INSULATE SHEATH METAL CONDUCTOR WIRE**

**EXPOSE METAL CONDUCTOR**

**WIRE NOABSTRACT**

**DERWENT-CLASS: P85 U11 U12**

**EPI-CODES: U11-D03A3; U12-A01A3; U12-A01A4;**

**SECONDARY-ACC-NO:**

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DOCUMENT-IDENTIFIER: JP 05134615 A

TITLE: MATRIX CIRCUIT BOARD AND DISPLAY PLATE

PUBN-DATE: May 28, 1993

INVENTOR-INFORMATION:

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APPL-DATE: November 11, 1991

INT-CL (IPC): G09F009/33, H01L033/00

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ABSTRACT:

PURPOSE: To enable the direct connection of a mother board and matrix circuit board to each other without using through-holes and stereoscopic printing circuit with a matrix circuit board by using metallic conductor wires

of which insulating parts exposed as pins for connecting at least in two directions on the flank.

CONSTITUTION: The spacings among three-dimensional wirings 14 of a plain network type are impregnated with an insulating material 3 and are simultaneously adhered to a supporting plate 2 to form the circuit board. The insulating parts to mount electric parts, etc., of the wirings 11 and wirings 12 exposed on the surface are removed to expose the metallic conductor wires when viewed in the plane of the insulation coated metallic conductor wires 1 stereoscopically wired in a network form. Monochromatic LED chips 4 are then adhered via solder to the wirings 11 and the wirings 12. The insulating parts to mount the electric parts, etc., of the wirings 11 and 12 and to

constitute

bonding pads are similarly removed to expose the metallic conductor wires and

LED pair chipes 6, are adhered via solder to the wirings 11 and are connected

by bonding pads 5 provided on the wirings 12 and the wires 7.

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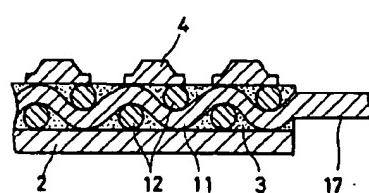
(54)【発明の名称】 マトリックス回路基板及び表示板

(57)【要約】

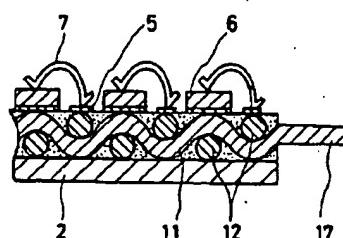
【目的】 マトリックス回路基板でスルーホールや立体印刷回路を用いないで、しかもマザーボードやマトリックス回路基板同志を直接接続する。

【構成】 少なくとも交互網目状に立体配線された絶縁被覆金属導体線の所望の絶縁部分を除去して金属導体線を露出させるとともに、側面の少なくとも2方向に接続用ピンとして絶縁部分を露出させた金属導体線を用いる。

(1)



(2)



1

## 【特許請求の範囲】

【請求項1】少なくとも交互網目状に立体配線された絶縁被覆金属導体線の所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板であって、側面の少なくとも2方向に接続用ピンとして絶縁部分を除去した金属導体線を露出してなることを特徴とするマトリックス回路基板。

【請求項2】請求項1記載のマトリックス回路基板の網目状立体配線の隙間に絶縁剤を含浸してなるマトリックス回路基板。

【請求項3】請求項1又は請求項2記載のマトリックス回路基板を絶縁剤を介して支持板に貼着してなるマトリックス回路基板。

【請求項4】請求項1、請求項2又は請求項3のマトリックス回路基板にダイオード、ランプ又は抵抗素子等の電気部品を搭載してなるマトリックス回路基板。

【請求項5】請求項1、請求項2又は請求項3のマトリックス回路基板に発光ダイオードを搭載してなる表示板。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、マトリックス回路基板上にダイオード、ランプ及び抵抗素子などの電気部品（以下電気部品という）を搭載するための回路基板、例えばドットマトリックス発光表示体用のダイオードドライバーを製造する場合に使用されるマトリックス回路基板及び表示板に関する。

## 【0002】

【従来の技術】この種のマトリックス回路基板においては、図4に示すように絶縁基板13の表と裏の両面にアノードまたはカソード側配線（以下配線という）12とカソードまたはアノード側配線（以下配線という）11からなる電極パターンを形成し、絶縁基板13の裏面側に形成された配線12をスルーホール8を介して絶縁基板13の表面側で配線11とした電極の表面電極9とは分離して形成した表面導電部10に接続し、このようにして形成した表面電極9と表面導電部10とに電気部品を接続することにより回路を形成している。

## 【0003】

【発明が解決しようとする課題】しかし、この種のマトリックス回路の構成方法では、平面上での導電部となる配線が交差するために、スルーホールを用いるかジャンパチップあるいは印刷導体による立体配線を行う必要があるので、工程が複雑になるばかりか接続の信頼性等に問題があった。また回路として用いられる導体の厚みとしては通常 $18\mu m$ 若しくは $35\mu m$ なので導体抵抗が大きく、導体としての回路が長くなると電圧降下により供給電圧に勾配が生じ、その結果例えば発光ダイオード（以下LEDという）においては輝度に差が出るなどの問題が起こり易くなる。

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【0004】さらにスルーホール用回路基板としては、絶縁材料として主に熱伝導性が悪いガラス繊維含有エポキシ樹脂基板が用いられるので、導体回路や搭載した電気部品からの発熱が蓄積しやすく回路上での誤作動などが発生する問題点があった。

## 【0005】

【課題を解決するための手段】本発明は、これらの問題を解決するための方法として種々検討した結果、金属導体線を予め絶縁された状態で網目状に立体配線することにより、少なくとも一方の平面上で回路を形成させることができ、しかも支持板として金属板を貼着することにより、電気部品や金属導体線回路から発生する熱をすみやかに放出し、さらに網目状立体配線の少なくとも2方向を予めピッチ以上に延長した金属導体線の絶縁部分を除去して接続用ピンとして使用することで、スルーホールを使用せずに駆動回路との接続を可能ならしめるという利点を見出し本発明を完成するに至った。

【0006】すなわち本発明は、少なくとも交互網目状に立体配線された絶縁被覆金属導体線の平面で見た際の所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板と該マトリックス回路基板に電気部品を搭載してなるマトリックス回路を有する機能部品またはマトリックス回路基板にLEDを搭載してなる表示板であって、網目状立体配線の少なくとも2方向の金属導体線を網目ピッチ以上に延長して金属導体線の絶縁部分を除去して接続用ピンとしたことを特徴とするものである。

## 【0007】

【作用及び実施例】以下図面により本発明を詳細に説明する。図1の(1)は、本発明の絶縁材料で被覆された絶縁被覆金属導体線1を縦糸と横糸として交互に織った平織り網目状立体配線14の斜視図であり、(2)は、絶縁剤3で含浸した平織り網目状立体配線14を平面で見た際に露出される絶縁被覆金属導体線1からなる配線11と配線12と、該配線11及び配線12を延長して絶縁部分を除去したカソードまたはアノード側接続用ピン（以下接続用ピンという）17及びアノードまたはカソード側接続用ピン（以下接続用ピンという）18を表す平面図である。

【0008】次に図2の(1)は、本発明の絶縁材料で被覆された絶縁被覆導体線1を縦糸と横糸として織り方を変えて織った絞織り網目状立体配線15の斜視図であり、(2)は、絶縁剤3で含浸した絞織り網目状立体配線15を平面で見た際に露出される絶縁被覆金属導体線1からなる配線11と配線12、該配線11及び配線12を延長して絶縁部分を除去した接続用ピン17及び接続用ピン18を表す平面図である。

【0009】また図3の(1)は、平織り網目状立体配線14の隙間に絶縁剤3で含浸すると同時に支持板2と接着させて回路基板とし、網目状に立体配線された絶縁

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被覆金属導体線1の平面で見た際に、表面に露出される配線11と配線12の電気部品等を搭載する絶縁部分を除去して金属導体線を露出させ、半田を介して単色しLEDチップ4を配線11と配線12とに接着した表示板の断面図である。

【0010】そして(2)は、同様に露出した配線11と配線12の電気部品等の搭載やボンディングパッドとなる絶縁部分を除去して金属導体線を露出させ、配線11に半田を介してLEDペアチップ6を接着し、配線12に設けたボンディングパッド5とワイヤー7で結線した断面図を表すものである。

【0011】本発明の絶縁被覆金属導体線1に用いる金属導体線としては、電気抵抗の小さい物なら材質として何ら制限はないが、電気抵抗及び価格の点から銅線が適している。そして金属導体線の線径としては特に制限はないが、電気抵抗を小さくするためにには太い方が良いが、あまり太いと織るのが困難になり、また回路全体も大きくなるので太さとしては直径で0.01mm～5mmの範囲が良い。さらに絶縁被覆された5mm以下の平角線でも良い。

【0012】また絶縁被覆材料としては、少なくとも交互に網目状に織ることのできる柔軟性を有する材質であれば良く、ポリウレタン、ポリエチレン、ポリプロピレン、ホルマール及び4フッ化エチレンなどの樹脂が使用可能である。

【0013】本発明の網目状立体配線の織り方は、平織り、綾織り及びその他回路上の電気部品の搭載位置により織り方を変えて網目状立体配線を形成することもできる。そして縦糸と横糸として用いる金属導体線は、線径が同一でも異なっていてもよく、さらに織る際に一方を金属導体線で、他方を絶縁被覆金属導体線とするか、又は両方を絶縁被覆金属導体線とするかのいづれかであっても差支えない。

【0014】次に本発明に用いる平織り網目状立体配線14及び綾織り網目状立体配線15等の網目状立体配線は柔軟性があるため補強として、また電気部品や導体回路からの発熱が問題になる時は、網目状立体配線の隙間に絶縁剤3として熱伝導性のよいフィラーを充填した樹脂を流し込み固化させて、既フィラー充填樹脂により電気部品や金属導体線回路からの放熱を効率よく行うことができる。

【0015】絶縁剤3として用いる樹脂としては、エポキシ及びフェノール等の液状熱硬化性樹脂、イミド樹脂やシリコーン樹脂等のエンジニアプラスチックス熱可塑性樹脂が用いられ、またフィラーとしては、熱伝導性の良い物なら特に制限ではなく、酸化アルミニウム(アルミナ)、窒化アルミニウム、窒化硼素、窒化珪素、酸化珪素及びコーチェライト等の微粉末が用いられる。

【0016】本発明の露出した金属導体線の部分には、例えばハンダペーストを塗布して電気部品を載置してハ

ンダリフローを行うという簡単な工程で電気部品の取り付けが行える。この時ハンダ付着性を上げるために又は金属導体線の腐食防止のためにニッケルメッキ及び金メッキなどの処理を行っても良い。さらに例えば配線12に設けるボンディングパッド5としては、金メッキ、銅メッキ及びニッケルメッキが使用される。

【0017】また本発明は、絶縁剤3を介して支持板2が使用されるが、熱伝導効率をあげる際には、例えばアルミニウム、珪素鋼、炭素鋼、SUS及びインバー等が用いられ、また熱伝導性をあまり必要としない際にはフェノール樹脂、イミド樹脂及びエポキシ樹脂等の樹脂板でも差支えない。

【0018】本発明のマトリックス回路基板は、例えば平織り又は綾織りした網目状立体配線の平面で見た際に露出する、片面又は両面の所望の位置の絶縁されていない金属導体線及び絶縁被覆金属導体線の絶縁材料を研磨またはフライス盤等で研削して金属導体線を露出させることにより作製することができるし、また金属導体線が両方とも絶縁材料で被覆されている際は、所望の位置の20絶縁材料を研磨またはフライス盤等で研削して金属導体線を露出させることにより作製することができる。

【0019】そしてこの回路基板は、必要により網目状立体配線の隙間に樹脂状物を含浸させることにより補強できるし、この際支持板を貼着することで種々の用途に使用できる回路基板を作製することができる。

【0020】次に本発明は、網目状立体配線した際に少なくとも2方向に絶縁層を除去した金属導体線を設けて接続用ピン17及び接続用ピン18とし、該接続用ピン17及び接続用ピン18は、マトリックス回路基板に電

30気部品を搭載した際に駆動させるためのマザーボードやマトリックス回路基板同志の接続用として使用することができる。

【0021】このように本発明は、種々の網目状立体配線を用いることによりマトリックス回路基板の製造が簡単に行え、しかも金属導体線や電気部品への供給電圧が安定となり、網目状立体配線の隙間に熱伝導性良好な絶縁剤を含浸することにより電気部品や金属導体線回路からの放熱性もよく、さらに交互網目状立体配線の少なくとも2方向を網目ピッチ以上に延長した金属導体線を接続用ピンとして使用することで、LEDを駆動させるためのマザーボードやLEDドット間隔を一定に保ったままでマトリックス回路基板同志の接続ができるという、極めて信頼性の高いマトリックス回路基板の作製が容易に行うことができる。さらにこのマトリックス回路基板をLEDディスプレイとして使用する場合は、必要に応じてハウジング等を取り付ければよい。

【0022】これらの特徴を利用した本発明のマトリックス回路基板の使用方法としては、搭載した機能部品の目的とする部分をスタティック又はダイナミックにドライプさせる事ができるので、例えばLEDやランプを搭

載すれば表示板として使用でき、抵抗素子を搭載すれば感熱紙への印字用ボード回路として使用することができる。

【0023】さらに実施例により本発明を具体的に説明する。

#### 実施例1

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って平織り網目状立体配線14とし、該網目状立体配線14の隣合う2辺の絶縁被覆金属導体線1を交差しない状態で接続用ピン17及び接続用ピン18として10mm延長し、支持板2である1.5mm厚のアルミニウム板から接続用ピン17及び接続用ピン18をはみ出した状態で乗せた。次に絶縁剤3として50容量%のアルミナ微粉末を充填した液状エポキシ樹脂（油化シェル（株）：商品名、エピコート807）を絶縁被覆金属導体線1の立体配線交点部表面が露出する程度まで流し込み硬化させ基板を作製し、表面に露出している絶縁被覆金属導体線1を研磨剤で銅線が露出するまで研磨して図1の（2）に示すマトリックス回路基板を作製した。さらにこのマトリックス回路基板の露出した銅線の必要な部分に表面実装用単色LEDチップ4（スタンレー社製BR1101W）を半田付けして図3の（1）に示すLED表示板を作製し、金属導体線の延長部分を予め半田バス（360°C、2分）に浸漬して絶縁被覆を剥しておき、接続用ピン17及び接続用ピン18として使用し駆動回路と接続した。

#### 【0024】実施例2

平織り網目状立体配線14の一方の銅線を被覆しないで用いた以外は、実施例1と同様な操作を行いLED表示板を作製した。

#### 【0025】実施例3

ポリウレタン樹脂で直径0.3mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を0.5mm間隔で網目状に織って平織り網目状立体配線14とし、該網目状立体配線14の隣合う2辺の絶縁被覆金属導体線1を交差しない状態で接続用ピン17及び接続用ピン18として10mm延長し、これを支持板2である1.5mm厚のアルミニウム板に接続用ピン17及び接続用ピン18の部分がはみ出した状態でのせ、以下は実施例1と同様な操作で回路基板を作製した。次にこのマトリックス回路基板の表面に露出している絶縁被覆金属導体線1を研磨材で銅線が露出するまで研磨して露出した銅線にニッケルメッキを行い、さらにその上に金メッキを行って、該メッキ部分に300μm角のLEDペアチップ6を配線11に半田付けし、また配線12に設けたボンディングパッド5とをワイヤー7として50μmの金線によりワイヤーボンディング接続して図3の（2）に示すLED表示板を作製した。

#### 【0026】実施例4

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って綾織り網目状立体配線15とし、以下実施例1と同様にして図2の（2）に示すマトリックス回路基板を作製した。さらにこのマトリックス回路基板の露出した銅線の必要な部分に表面実装用2色LEDチップ16（スタンレー社製BRPY1201W）を半田付けしてLED表示板を作製した。

#### 【0027】実施例5

10 絶縁剤3としてフィラーを充填しない液状エポキシ樹脂を用い、また支持板2として厚さ2.0mmのフェノール板を用いた以外は、実施例1及び実施例2と同様な操作をしてLED表示板をそれぞれ作製した。

#### 【0028】実施例6

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って平織り網目状立体配線14とし、該網目状立体配線14の隣合う2辺の絶縁被覆金属導体線1を交差しない状態で接続用ピン17及び接続用ピン18として10mm延長させた。次に平織り網目状立体配線14の接続用ピン17及び接続用ピン18を上向きに立てて、絶縁剤3として50容量%のアルミナ微粉末を充填した液状エポキシ樹脂（油化シェル（株）：商品名、エピコート807）が接続用ピン17及び接続用ピン18の部分に付かない様にして、立体配線交点部表面が露出する程度まで流し込み硬化させ基板を作製し、表面に露出している絶縁被覆金属導体線1を研磨剤で銅線が露出するまで研磨して図1の（2）に示すマトリックス回路基板を作製した。さらにこのマトリックス回路基板

20 20 は、露出した銅線の必要な部分に表面実装用単色LEDチップ4（スタンレー社製BR1101W）を半田付けして図3の（1）に示すLED表示板を作製し、金属導体線の延長部分を予め半田バス（360°C、2分）に浸漬し絶縁被覆を剥しておき、接続用ピン17及び接続用ピン18として使用し駆動回路と接続した。

#### 【0029】実施例7

実施例1と同様にして図1の（2）に示すマトリックス回路基板を作製し、これにダイオードや抵抗素子を搭載してマトリックス回路を有する機能部品を作製し、金属導体線の延長部分を予め半田バス（360°C、2分）に浸漬し絶縁被覆を剥しておき、接続用ピン17及び接続用ピン18として使用し駆動回路と接続した。

#### 【0030】実施例8

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に織って綾織り網目状立体配線15とし、以下実施例1と同様にして図2の（2）に示すマトリックス回路基板を作製した。さらにこの回路基板の露出した銅線の必要な部分にダイオードや抵抗素子を搭載してマトリックス回路を有する機能部品を作製し、金属導体線の

50 50 は、露出した銅線の必要な部分に表面実装用単色LEDチップ4（スタンレー社製BR1101W）を半田付けして図3の（1）に示すLED表示板を作製し、金属導体線の延長部分を予め半田バス（360°C、2分）に浸漬し絶縁被覆を剥しておき、接続用ピン17及び接続用ピン18として使用し駆動回路と接続した。

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延長部分を予め半田バス（360°C、2分）に浸漬し絶縁被覆を剥しておき、接続用ピン17及び接続用ピン18として使用し駆動回路と接続した。

## 【0031】

【発明の効果】以上のとおり本発明によればマトリックス回路基板は、スルーホール等無しで容易に作ることができ、しかも該回路基板はフィラーを含浸することで放熱性が向上し、また金属導体線である銅線の直径を大きくすることで通常用いられる銅箔回路よりも電気抵抗が小さくできるので、例えばLED表示用のマトリックス回路として、安価で輝度のバラツキが小さく、しかも放熱性の良好な表示板を得ることができるし、印字用ボード回路として使用することも可能である。さらに、本発明のマトリックス回路基板は、立体配線の金属導体線を交差しない状態で延長した部分の絶縁被覆を除去して接続用ピンとして使用してできるため、特別な接続部品を使用せずに、他の駆動用回路等の回路基板と接続が容易にできるという利点がある。

## 【図面の詳細な説明】

【図1】図1の（1）は、絶縁被覆金属導体線を交互に織った平織り網目状立体配線の斜視図であり、（2）は、平織り網目状立体配線を平面で見た際に露出される絶縁被覆金属導体線の各々からなる配線と延長した金属導体線からなる接続用ピンを表す平面図である。

【図2】図2の（1）は、絶縁被覆金属導体線の織り方を変えて織った斜織り網目状立体配線の斜視図であり、（2）は、斜織り網目状立体配線を平面で見た際に露出

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される絶縁被覆金属導体線の各々からなる配線と延長した金属導体線からなる接続用ピンを表す平面図である。

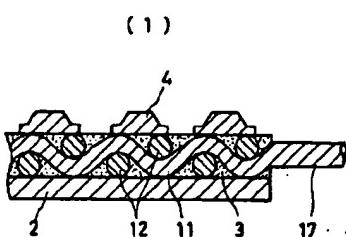
【図3】図3の（1）は支持板付きマトリックス回路基板の表面に、表面実装用単色LEDチップを搭載した時の断面図であり、（2）は同様の回路基板にLEDペアチップを搭載した時の断面図である。

【図4】図4は、従来の表示板を表す断面図である。

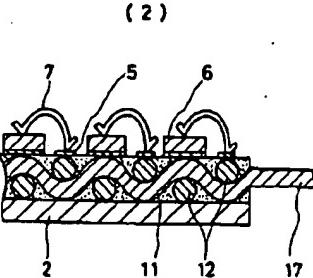
## 【符号の説明】

- |    |                   |
|----|-------------------|
| 1  | 絶縁被覆金属導体線         |
| 2  | 支持板               |
| 3  | 絶縁剤               |
| 4  | 単色発光ダイオードチップ      |
| 5  | ポンディングパッド         |
| 6  | 発光ダイオードペアチップ      |
| 7  | ワイヤー              |
| 8  | スルーホール            |
| 9  | 表面電極              |
| 10 | 表面導電部             |
| 11 | カソードまたはアノード側配線    |
| 12 | アノードまたはカソード側配線    |
| 13 | 絶縁基板              |
| 14 | 平織り網目状立体配線        |
| 15 | 斜織り網目状立体配線        |
| 16 | 2色発光ダイオードチップ      |
| 17 | カソードまたはアノード側接続用ピン |
| 18 | アノードまたはカソード側接続用ピン |

【図3】

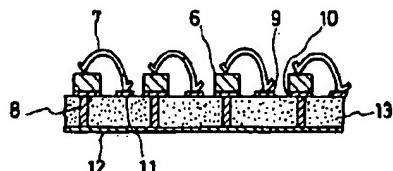


(1)

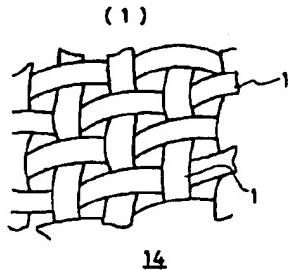


(2)

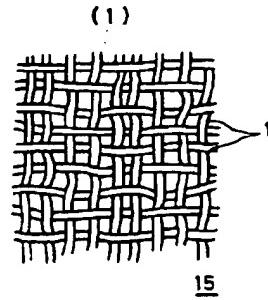
【図4】



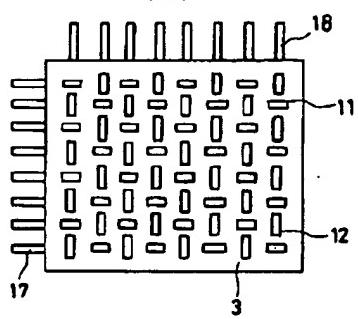
【図1】



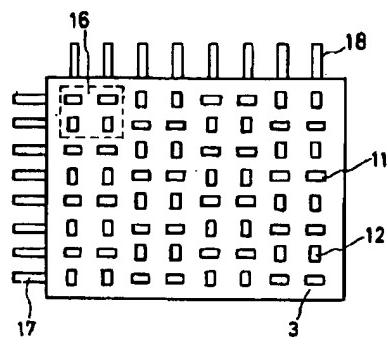
【図2】



(2)



(2)



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